

CETIFICATION

SDG No: MC47750 Laboratory: Accutest, Massachusetts
 Site: BMS, Building 5 Area, PR Matrix: Groundwater
 Humacao, PR

SUMMARY: Groundwater samples (Table 1) were collected on the BMSMC facility – Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were taken September 8-12, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC47750. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusetts Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC47750-1	S-41S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC47750-2	S-41D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC47750-3	S-32	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC47750-4	S-35D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC47750-5	S-35	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC47750-6	S-38	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges

Reviewer Name: Rafael Infante
 Chemist License 1888

Signature:

Rafael Infante

Date:

October 4, 2016



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Client Sample ID:	S-41S	Date Sampled:	09/08/16
Lab Sample ID:	MC47750-1	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77642.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	9.6	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	9.8	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	13.9	50	9.7	ug/l	JB
	C5- C8 Aliphatics	9.6	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	88%		70-130%
	2,3,4-Trifluorotoluene	86%		70-130%



ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-41S	Date Sampled:	09/08/16
Lab Sample ID:	MC47750-1	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15622.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

	Initial Volume	Final Volume
Run #1	950 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	36.4	110	30	ug/l	J
	C9-C18 Aliphatics	40.9	110	18	ug/l	JB
	C19-C36 Aliphatics	42.3	110	29	ug/l	JB
	C11-C22 Aromatics	36.4	110	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	91%		40-140%
321-60-8	2-Fluorobiphenyl	96%		40-140%
3386-33-2	1-Chlorooctadecane	79%		40-140%
580-13-2	2-Bromonaphthalene	104%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-41D
Lab Sample ID: MC47750-2
Matrix: AQ - Ground Water
Method: MADEP VPH REV 1.1
Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/08/16
Date Received: 09/13/16
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77650.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	12.4	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	9.3	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	15.0	50	9.7	ug/l	JB
	C5- C8 Aliphatics	11.9	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	86%		70-130%
	2,3,4-Trifluorotoluene	87%		70-130%



ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Client Sample ID: S-41D
 Lab Sample ID: MC47750-2
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/08/16
 Date Received: 09/13/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15623.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

	Initial Volume	Final Volume
Run #1	950 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	44.5	110	30	ug/l	J
	C9-C18 Aliphatics	40.7	110	18	ug/l	JB
	C19-C36 Aliphatics	45.2	110	29	ug/l	JB
	C11-C22 Aromatics	44.5	110	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	92%		40-140%
321-60-8	2-Fluorobiphenyl	94%		40-140%
3386-33-2	1-Chlorooctadecane	89%		40-140%
580-13-2	2-Bromonaphthalene	103%		40-140%



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Client Sample ID:	S-32	Date Sampled:	09/09/16
Lab Sample ID:	MC47750-3	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77640.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2	WX77641.D	100	09/16/16	AF	n/a	n/a	GWX3839

	Purge Volume
Run #1	5.0 ml
Run #2	5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	135	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	92000 ^a	5000	800	ug/l	
	C9- C10 Aromatics (Unadj.)	305	50	9.7	ug/l	
	C5- C8 Aliphatics	78.6	50	8.8	ug/l	
	C9- C12 Aliphatics	4780	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	97%	87%	70-130%
	2,3,4-Trifluorotoluene	97%	88%	70-130%

(a) Result is from Run# 2



ND = Not detected MDL = Method Detection Limit
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J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-32	Date Sampled:	09/09/16
Lab Sample ID:	MC47750-3	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15624.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

Run #	Initial Volume	Final Volume
Run #1	970 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	47.6	100	30	ug/l	J
	C9-C18 Aliphatics	41.2	100	17	ug/l	JB
	C19-C36 Aliphatics	119	100	28	ug/l	B
	C11-C22 Aromatics	47.6	100	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	76%		40-140%
321-60-8	2-Fluorobiphenyl	93%		40-140%
3386-33-2	1-Chlorooctadecane	111%		40-140%
580-13-2	2-Bromonaphthalene	104%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-35D
Lab Sample ID: MC47750-4
Matrix: AQ - Ground Water
Method: MADEP VPH REV 1.1
Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/09/16
Date Received: 09/13/16
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77649.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	13.5	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	9.4	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.2	50	9.7	ug/l	JB
	C5- C8 Aliphatics	13.1	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	85%		70-130%
	2,3,4-Trifluorotoluene	85%		70-130%



ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID:	S-35D	Date Sampled:	09/09/16
Lab Sample ID:	MC47750-4	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15625.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	40.3	100	29	ug/l	J
	C9-C18 Aliphatics	47.5	100	17	ug/l	JB
	C19-C36 Aliphatics	49.6	100	28	ug/l	JB
	C11-C22 Aromatics	40.3	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	104%		40-140%
321-60-8	2-Fluorobiphenyl	100%		40-140%
3386-33-2	1-Chlorooctadecane	81%		40-140%
580-13-2	2-Bromonaphthalene	109%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-35
Lab Sample ID: MC47750-5
Matrix: AQ - Ground Water
Method: MADEP VPH REV 1.1
Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/09/16
Date Received: 09/13/16
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77648.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	21.6	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	9.3	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.7	50	9.7	ug/l	JB
	C5- C8 Aliphatics	18.9	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	86%		70-130%
	2,3,4-Trifluorotoluene	85%		70-130%



ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID: S-35
 Lab Sample ID: MC47750-5
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/09/16
 Date Received: 09/13/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15626.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	41.0	110	31	ug/l	J
	C9-C18 Aliphatics	42.2	110	18	ug/l	JB
	C19-C36 Aliphatics	49.0	110	29	ug/l	JB
	C11-C22 Aromatics	41.0	110	31	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	103%		40-140%
321-60-8	2-Fluorobiphenyl	105%		40-140%
3386-33-2	1-Chlorooctadecane	90%		40-140%
580-13-2	2-Bromonaphthalene	114%		40-140%



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Client Sample ID: S-38
Lab Sample ID: MC47750-6
Matrix: AQ - Ground Water
Method: MADEP VPH REV 1.1
Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/12/16
Date Received: 09/13/16
Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX77634.D	1	09/16/16	AF	n/a	n/a	GWX3839
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	61.8	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	29.7	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	21.9	50	9.7	ug/l	JB
	C5- C8 Aliphatics	57.2	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	89%		70-130%
	2,3,4-Trifluorotoluene	90%		70-130%



ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID:	S-38	Date Sampled:	09/12/16
Lab Sample ID:	MC47750-6	Date Received:	09/13/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15627.D	1	09/27/16	AP	09/14/16	OP48695	GDE871
Run #2							

Run #	Initial Volume	Final Volume
Run #1	900 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	46.0	110	32	ug/l	J
	C9-C18 Aliphatics	42.3	110	19	ug/l	JB
	C19-C36 Aliphatics	47.1	110	30	ug/l	JB
	C11-C22 Aromatics	46.0	110	32	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	100%		40-140%
321-60-8	2-Fluorobiphenyl	103%		40-140%
3386-33-2	1-Chlorooctadecane	82%		40-140%
580-13-2	2-Bromonaphthalene	113%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound



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EXECUTIVE NARRATIVE

SDG No: **MC47750** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP VPH** Number of Samples: **6**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Six (6) samples were analyzed for Extractables TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (EVH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings: 1. Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: Rafael Infante
Chemist License 1888

Signature:



Date: October 4, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC47750-1

Sample location: BMSMC Building 5 Area

Sampling date: 9/8/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	9.6	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.8	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.9	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	9.6	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC47750-2

Sample location: BMSMC Building 5 Area

Sampling date: 9/8/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	12.4	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.3	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	15	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	11.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50.0	ug/L	1	-	U	Yes

Sample ID: MC47750-3
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	135	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	92000	ug/L	100	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	305	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	78.6	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics	4780	ug/L	1	-	-	Yes

Sample ID: MC47750-4
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	13.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.4	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.2	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	13.1	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC47750-5
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	21.6	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.3	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.7	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	18.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC47750-6
Sample location: BMSMC Building 5 Area
Sampling date: 9/12/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	61.8	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	29.7	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	21.9	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	57.2	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: X Project Number: MC47750
 Limited: _____ Date: 09/08-12/2016
 Shipping date: 09/12/2016
 EPA Region: 2

REVIEW OF VOLATILE PETROLEUM HYDROCARBON (VPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC47750 Sample matrix: Groundwater
 No. of Samples: 6
 Field blank No.: _____
 Equipment blank No.: _____
 Trip blank No.: _____
 Field duplicate No.: _____

<u>X</u> Data Completeness	<u>X</u> Laboratory Control Spikes
<u>X</u> Holding Times	<u>X</u> Field Duplicates
<u>N/A</u> GC/MS Tuning	<u>X</u> Calibrations
<u>N/A</u> Internal Standard Performance	<u>X</u> Compound Identifications
<u>X</u> Blanks	<u>X</u> Compound Quantitation
<u>X</u> Surrogate Recoveries	<u>X</u> Quantitation Limits
<u>X</u> Matrix Spike/Matrix Spike Duplicate	

Overall Comments: Volatiles by GC by Method MADEP_VPH_REV_1.1_
 (C5_to_C12_Aliphatics; C9_to_C10_Aromatics)

Definition of Qualifiers:

J- Estimated results
 U- Compound not detected
 R- Rejected data
 UJ- Estimated nondetected

Reviewer: Rafael Defaut
 Date: 10/04/2016

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. **Data Package:**

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

[illegible]

B. Other

Discrepancies:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples analyzed within method recommended holding time				

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purge-and-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days.

Soil/sediment samples - analysis within 28 days.

Cooler temperature (Criteria: 4 ± 2 °C): 4.5°C

Actions: Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 08/17/16

Dates of initial calibration verification: 08/17/16

Instrument ID numbers: GCWX

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and initial calibration verification meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9-C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and

DATA REVIEW WORKSHEETS

percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: _____ 08/17/16 _____

Dates of continuing calibration verification: _____ 09/16/16 _____

Dates of final calibration verification: _____ 09/17/16 _____

Instrument ID numbers: _____ GCWX _____

Matrix/Level: _____ AQUEOUS/MEDIUM _____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Continuing and final calibration verification meets method specific requirements.				

Note:

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEET

All criteria were met _____
 Criteria were not met and/or see below ____X____

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
_METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA_EXCEPT_FOR_ THE_FOLLOWING:_____				

_09/16/16__GWX3839-MB__AQUEOUS__C9-C12_(Aliphatics)_____10.1_ug/L_____				
_____C9-C10_(Aromatics)_____18.0_ug/L_____				

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

Field/Trip/Equipment

A methanol trip blank or acidified reagent water trip blank **should** continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
_NO_TRIP/FIELD/EQUIPMENT_BLANKS_ASSOCIATED_WITH_THIS_DATA_				
_PACKAGE._____				

Note:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND	ACTION
	2,3,4-Trifluorotoluene	

 SURROGATE_STANDARD_RECOVERIES_WITHIN_LABORATORY_CONTROL
 LIMITS

QC Limits* (Aqueous)

 LL to UL 70 to 130 to to

QC Limits* (Solid)

 LL to UL to to to

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met _____
Criteria were not met and/or see below X

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 - 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: MC47750-6_MS/MSD Matrix/Level: Groundwater

List the %Rs, RPD of the compounds which do not meet the QC criteria.

Note: MS/MSD % recovery and RPD within laboratory control limits.

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION		MSD	%RPD	ACTION
	SAMPLE	MS			

Criteria: None specified, use $\%RSD \leq 50$ as professional judgment.

Actions:

If the $\% RSD > 50$, qualify the results in the spiked sample as estimate (J).

If the $\% RSD$ is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

All criteria were met X
Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
--------	----------	-----	----------	--------

 LCS_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMITS

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the exceedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met _____
 Criteria were not met and/or see below ___N/A___

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: _____ - _____

Matrix: ___ - ___

Field/laboratory duplicate samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
No field/laboratory duplicate analyzed with this data package. MS/MSD RPD results used to assess precision. RPD within laboratory and validation guidance document criteria (+ 50 %) for analytes detected above reporting limits.					

Criteria:

The project QAPP should be reviewed for project-specific information.
 RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL.
 If both samples and duplicate are <5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is \geq 5x the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - Coelution of the m- and p- xylene isomers is permissible.
 - All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

1. In the space below, please show a minimum of one sample calculation:

MC47750-3 VPH (C5 – C7 Aliphatics) RF = 2.135×10^4

FID

$$[] = (49992)/(2.135 \times 10^4)$$

$$[] = 2.34 \text{ ppb} \quad \text{Ok}$$

MC47750-3 VPH (C9 – C10 Aromatics) RF = 1.257×10^4

PID

$$[] = (3829202)/(1.257 \times 10^4)$$

$$[] = 304.6 \text{ ppb} \quad \text{Ok}$$

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).

3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION
MC47750-3	100	Aliphatic hydrocarbons over calibration range.

If dilution was not performed and the results were above the concentration range, estimate results (J) for the affected compounds. List the affected samples/compounds:

EXECUTIVE NARRATIVE

SDG No: **MC47833** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP EPH** Number of Samples: **8**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Eight (8) samples were analyzed for Extractables TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings: 1. Sample preservation temperature over the recommended range of 4 ± 2 °C but < 10°C. No action taken, professional judgment.

2. Initial and continuing calibration meets method specific requirements. Closing calibration included in data package. Closing calibration meets method specific requirements except for the cases described in the Data Review Worksheet. No action taken, professional judgment.

3. Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: Rafael Infante
Chemist License 1888

Signature:



Date: October 5, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC47750-1

Sample location: BMSMC Building 5 Area

Sampling date: 9/8/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	36.4	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	40.9	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	42.3	ug/L	1	JB	U	Yes
Ç11 - C22 Aliphatics	36.4	ug/L	1	J	J	Yes

Sample ID: MC47750-2

Sample location: BMSMC Building 5 Area

Sampling date: 9/8/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	44.5	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	40.7	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	45.2	ug/L	1	JB	U	Yes
Ç11 - C22 Aliphatics	44.5	ug/L	1	J	J	Yes

Sample ID: MC47750-3
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	47.6	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	41.2	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	119	ug/L	1	B	-	Yes
Ç11 - C22 Aliphatics	47.6	ug/L	1	J	J	Yes

Sample ID: MC47750-4
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	40.3	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	47.5	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	49.6	ug/L	1	JB	U	Yes
Ç11 - C22 Aliphatics	40.3	ug/L	1	J	J	Yes

Sample ID: MC47750-5
Sample location: BMSMC Building 5 Area
Sampling date: 9/9/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	41.0	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	42.2	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	49.0	ug/L	1	JB	U	Yes
Ç11 - C22 Aliphatics	41.0	ug/L	1	J	J	Yes

Sample ID: MC47750-6
Sample location: BMSMC Building 5 Area
Sampling date: 9/12/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	46.0	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	42.3	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	47.1	ug/L	1	JB	U	Yes
Ç11 - C22 Aliphatics	46.0	ug/L	1	J	J	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: ☒ Limited: ☐ Project Number: MC47750
 Date: 09/08-12/2016
 Shipping date: 09/12/2016
 EPA Region: 2

REVIEW OF EXTRACTABLE PETROLEUM HYDROCARBON (EPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC47750 Sample matrix: Groundwater
 No. of Samples: 6
 Field blank No.: -
 Equipment blank No.: -
 Trip blank No.: -
 Field duplicate No.: -

<input checked="" type="checkbox"/> Data Completeness	<input checked="" type="checkbox"/> Laboratory Control Spikes
<input checked="" type="checkbox"/> Holding Times	<input checked="" type="checkbox"/> Field Duplicates
<input type="checkbox"/> GC/MS Tuning	<input checked="" type="checkbox"/> Calibrations
<input type="checkbox"/> Internal Standard Performance	<input checked="" type="checkbox"/> Compound Identifications
<input checked="" type="checkbox"/> Blanks	<input checked="" type="checkbox"/> Compound Quantitation
<input checked="" type="checkbox"/> Surrogate Recoveries	<input checked="" type="checkbox"/> Quantitation Limits
<input checked="" type="checkbox"/> Matrix Spike/Matrix Spike Duplicate	

Overall Comments:
 Extractable Petroleum Hydrocarbons by GC by Method MADEP_EPH_REV_1.1.
 (C9_to_C36_Aliphatics; C11_to_C22_(Aromatics))

Definition of Qualifiers:

J- Estimated results
 U- Compound not detected
 R- Rejected data
 UJ- Estimated not detected

Reviewer: 
 Date: 10/04/2016

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. Data Package:

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

[illegible]

B. Other

Discrepancies:

[illegible]

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples extracted and analyzed within method recommended holding time				

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature (Criteria: 4 ± 2 °C): 4.5°C

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 08/05/16

Dates of initial calibration verification: 08/05/16

Instrument ID numbers: GCDE

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and initial calibration verification meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

DATA REVIEW WORKSHEETS

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: _____ 08/05/16 _____

Dates of continuing calibration verification: _____ 09/27/16 _____

Dates of final calibration verification: _____ 09/27/16 _____

Instrument ID numbers: _____ GCDE _____

Matrix/Level: _____ AQUEOUS/MEDIUM _____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and continuing calibration meets method specific requirements. Closing calibration included in data package. Closing calibration meets method specific requirements except for the cases described in this document. No action taken, professional judgment.				
09/27/16	cc843-50	C11-C22 Aromatics (Unadj.)	99.8 %	MC47750-1 to -6

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEET

All criteria were met _____
 Criteria were not met and/or see below X

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA EXCEPT IN				
_THE CASES DESCRIBED IN THIS DOCUMENT. _____				

_09/27/16	OP48695-MB	Aq./low	C9-C18_Aliphatics	41.1 ug/l
			C19-C36_Aliphatics	40.6 ug/l

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

Field/Trip/Equipment

A methanol trip blank or acidified reagent water trip blank **should** continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
NO TRIP/FIELD/EQUIPMENT BLANKS ASSOCIATED WITH THIS DATA				
_PACKAGE. _____				

Note:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND				ACTION
	S1	S2	S3	S4	
<u>SURROGATE STANDARDS RECOVERIES WITHIN LABORATORY CONTROL</u>					
<u>LIMITS.</u>					

S1 = o-Terphenyl 40-140%

S2 = 2-Fluorobiphenyl 40-140%

S3 = 1-Chlorooctadecane 40-140%

S4 = 2-Bromonaphthalene 40-140%

QC Limits (%)* (Aqueous)

 LL to UL 40 to 140 40 to 140 40 to 140 40 to 140

QC Limits* (Solid)

 LL to UL to to to

Note:

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met _____
 Criteria were not met and/or see below ____N/A____

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 - 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: _____ - _____ Matrix/Level: _____ - _____

List the %Rs, RPD of the compounds which do not meet the QC criteria.

MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

Note: No MS/MSD analyzed with this data package. Blank spike/blank spike duplicate used to assess accuracy. % recoveries and RPD within laboratory control limits.

DATA REVIEW WORKSHEETS

All criteria were met _____
 Criteria were not met and/or see below ___N/A___

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION		MS	MSD	%RPD	ACTION
	SAMPLE					

Criteria: None specified, use %RSD \leq 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J).

If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
<u> LCS_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMITS </u>				

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R and RPD criteria and the magnitude of the exceedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met _____
 Criteria were not met and/or see below N/A

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: _____

Matrix: _____ - _____

Field/laboratory duplicate samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
No field/laboratory duplicate analyzed with this data package. BS/BSD % recovery RPD used to assess precision. RPD within laboratory and validation guidance document criteria (+ 50 % RPD) for analytes concentration ≥ 5 SQL.					

Criteria:

The project QAPP should be reviewed for project-specific information.
 RPD $\pm 30\%$ for aqueous samples, RPD $\pm 50\%$ for solid samples if results are \geq SQL.
 If both samples and duplicate are < 5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is ≥ 5 x the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5 x the SQL, use professional judgment to determine if qualification is appropriate.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.
- 1a. Aliphatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
 - Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

- 1b. Aromatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
 - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.
3. Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. **If either the concentration of naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.**

NOTE: The total concentration of naphthalene or 2-methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction.

 Comments: Concentration in the aliphatic fraction < 5% of the total
 concentration for naphthalene and 2-methylnaphthalene

4. **Fractionation Check Standard** – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/μl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analyte contained in the fractionation check solution, excluding n-nonane, the Percent Recovery must be between 40 and 140%. A 30% Recovery is acceptable for n-nonane.

Is a fractionation check standard analyzed?

Yes? or No?

Comments: Not applicable.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample? Yes? or No?

Is aromatic mass discrimination observed in the sample? Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

JC47750-3 EPH (C11 – C22, Aromatics) RF = 114,553

[] = (2646414)/(114,553)

[] = 23.1 ug/ml Ok

JC47750-3 EPH (C19 – C36, Aliphatics) RF = 72,594

[] = (4178514)/(72,594)

[] = 57.6 ug/ml Ok

DATA REVIEW WORKSHEETS

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION

If dilution was not performed, estimate results (J) for the affected compounds. List the affected samples/compounds:
